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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/787,217	02/27/2004	Kevin Faulkner	6502.0565	4697

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EXAMINER	
MOFIZ, APU M	

ART UNIT	PAPER NUMBER
2165	

DATE MAILED: 12/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/787,217	FAULKNER ET AL.	
	Examiner	Art Unit	
	Apu M. Mofiz	2165	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,31-38 and 46* is/are rejected.

7)☒ Claim(s) *12-30 and 39-45* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/02/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Examiner's Response to Applicant's Remarks

1. Applicant's arguments submitted on 11/03/2006 with respect to claims 1-46 have been reconsidered but are not deemed persuasive for the reasons set forth below.

Examiner's Responses to Applicant's Remarks are listed below:

2. Applicant argues (under REMARKS section) that, Chandrasekaran does not teach "a second virtualization layer that maintains a second tier object including information reflecting a logical configuration of the virtual volume."

Examiner respectfully disagrees. Chandrasekaran teaches a system for providing one or more virtual volumes (i.e., "FIG. 1 is a diagrammatic representation of one example of a storage area network that can use the techniques of the present invention. A switch 101 is coupled to switches 103 and 105 as well as to a host 111 and storage 121. (col 3, lines 8-12) ... techniques such as virtualization and mapping are used to spread the data across multiple storage devices. (col 3, lines 26-29) ...**the host is only aware that it is communicating with a volume or some other virtual representation of a storage device**. According to various embodiments, fibre channel switches such as switch 101 transparently map disk access by the host onto one or more virtual disks. (col 3, lines 62-66) ... A host issuing a read access request for data segments 311, 313, and 315 in a virtual disk address space is actually accessing data segments 321, 323, and 325 in a virtual disk 341. A virtual disk 341 may include multiple physical partitions in separate physical disks. (col 4, lines 43-47) ... FIG. 5 is a diagrammatic representation showing a

virtual address space and a corresponding virtual disk. It should be noted that each virtual address space may be mapped to multiple virtual disks for purposes such as mirroring and striping. (col 5, lines 28-33) ... a host writes a data block 531 to a virtual address 533 in virtual address space 541. The offset 535 from the start of the virtual address space is 4GB. The length of data block 531 is also 4 GB. In some examples, the virtual address 533 is referred to as the virtual logical unit logical block address and the length of the data block 531 is referred to as the transfer length. (col 5, lines 29-46) ... Virtual disk address 533 having an address of 4GB would not fall in physical partition 551. Using the linked list, the next Physical partition 553 would be examined to determine the characteristics of the physical partition 553. (col 5, lines 50-60) ... FIG. 6 is a flow process diagram showing one example of a disk access using a linked list. At 601, **the fibre channel switch in a storage area network receives a read or write access request from a host**. ... **the virtual disk address is a virtual logical unit logical block address that is mapped to a plurality of virtual disks based on striping and mirroring needs**. In one example, the virtual disk address is mapped onto two different virtual disks to allow for mirroring. At 605, the virtual disks relevant to the read or write operation are identified. As noted above, **each virtual disk typically includes multiple physical partitions**. To determine the physical partition with the target address where the read or write operation should be performed, the **different physical partitions are stepped through using the link list** (col 6, lines 17-36)" The preceding text excerpts clearly indicate that in a storage area network (i.e., all storage has its own processor), a host unit requests through a switch access (i.e., read or write) to a storage device (or multiple storage devices). The switch uses first tier and second tier information/ objects to access (i.e., read or write access by a host) the storage. The first tier

information consists of mapping data between physical addresses to logical/virtual address (e.g., it uses a linked list for mapping physical partitions/blocks to virtual disk). The second tier information consists of logical configuration of virtual volume, wherein virtual address space is mapped to multiple virtual disks (i.e., mirrored, striped etc.). Therefore, Chandrasekaran clearly teaches a host system issuing an access request to a switch, wherein the switch manages access to the storage by using first tier (i.e., first virtualization layer, which includes information about mapping virtual disks (i.e., logical partitions of virtual volume) to physical address/partition/blocks)) information/objects and second tier (i.e., second virtualization layer, which includes information about logical configuration of a virtual volume (i.e., mapping between virtual disk address, which is a virtual logical unit logical block address, to a plurality of virtual disks and simply a logical configuration of virtual volume). Each virtual volume may consist of multiple virtual disks. Therefore, Applicant's argument that Chandrasekaran does not teach two virtualization layer and especially second virtualization layer that maintains information reflecting a logical configuration of the virtual volume is not valid.), comprising: a host system; a set of storage devices, each of which includes physical block addresses that stores data (see explanations above); and a network switch system connecting the host system and the set of storage devices (see explanations above), and configured to define and manage a virtual volume associated with data distributed across the physical block addresses, the network switch system (see explanations above) including: a first virtualization layer that maintains first tier objects including information reflecting a relationship between the physical block addresses and one or more logical partitions of virtual volume data (see explanations above), and a second virtualization layer that

maintains second tier objects including information reflecting a logical configuration of the virtual volume (see explanations above), wherein the network switch system manages the virtual volume for the host system using the first and second tier objects (see explanations above).

Any other arguments by the applicant are more limiting than the claimed language.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-11,31,32-38 and 46 are rejected under 35 U.S.C. 102(e) as being anticipated by Varagur Chandrasekaran (U.S. Patent No. 6,948,044 and Chandrasekaran hereinafter).

As to claim 1,31 and 32, Chandrasekaran teaches a system for providing one or more virtual volumes (i.e., "FIG. 1 is a diagrammatic representation of one example of a storage area network that can use the techniques of the present invention. A switch 101 is coupled to switches 103 and 105 as well as to a host 111 and storage 121. (col 3, lines 8-12) ...

techniques such as virtualization and mapping are used to spread the data across multiple storage devices. (col 3, lines 26-29) ...**the host is only aware that it is communicating with a volume or some other virtual representation of a storage device**. According to various embodiments, fibre channel switches such as switch 101 transparently map disk access by the host onto one or more virtual disks. (col 3, lines 62-66) ... A host issuing a read access request for data segments 311, 313, and 315 in a virtual disk address space is actually accessing data segments 321, 323, and 325 in a virtual disk 341. A virtual disk 341 may include multiple physical partitions in separate physical disks. (col 4, lines 43-47) ... FIG. 5 is a diagrammatic representation showing a virtual address space and a corresponding virtual disk. It should be noted that each virtual address space may be mapped to multiple virtual disks for purposes such as mirroring and striping. (col 5, lines 28-33) ... a host writes a data block 531 to a virtual address 533 in virtual address space 541. The offset 535 from the start of the virtual address space is 4GB. The length of data block 531 is also 4 GB. In some examples, the virtual address 533 is referred to as the virtual logical unit logical block address and the length of the data block 531 is referred to as the transfer length. (col 5, lines 29-46) ... Virtual disk address 533 having an address of 4GB would not fall in physical partition 551. Using the linked list, the next Physical partition 553 would be examined to determine the characteristics of the physical partition 553. (col 5, lines 50-60) ... FIG. 6 is a flow process diagram showing one example of a disk access using a linked list. At 601, **the fibre channel switch in a storage area network receives a read or write access request from a host. ... the virtual disk address is a virtual logical unit logical block address that is mapped to a plurality of virtual disks based on striping and mirroring needs**. In one example, the virtual disk address is mapped onto two different virtual disks to

allow for mirroring. At 605, the virtual disks relevant to the read or write operation are identified. As noted above, **each virtual disk typically includes multiple physical partitions**. To determine the physical partition with the target address where the read or write operation should be performed, the **different physical partitions are stepped through using the link list** (col 6, lines 17-36)" The preceding text excerpts clearly indicate that in a storage area network (i.e., all storage has its own processor), a host unit requests through a switch access (i.e., read or write) to a storage device (or multiple storage devices). The switch uses first tier and second tier information/ objects to access (i.e., read or write access by a host) the storage. The first tier information consists of mapping data between physical addresses to logical/virtual address (e.g., it uses a linked list for mapping physical partitions/blocks to virtual disk). The second tier information consists of logical configuration of virtual volume, wherein virtual address space is mapped to multiple virtual disks (i.e., mirrored, striped etc.). Therefore, Chandrasekaran clearly teaches a host system issuing an access request to a switch, wherein the switch manages access to the storage by using first tier (i.e., first virtualization layer, which includes information about mapping virtual disks (i.e., logical partitions of virtual volume) to physical address/partition/blocks)) information/objects and second tier (i.e., second virtualization layer, which includes information about logical configuration of a virtual volume (i.e., mapping between virtual disk address, which is a virtual logical unit logical block address, to a plurality of virtual disks and simply a logical configuration of virtual volume). Each virtual volume may consist of multiple virtual disks. Therefore, Applicant's argument that Chandrasekaran does not teach two virtualization layer and especially second virtualization layer that maintains information reflecting a logical configuration of the virtual volume is not valid.), comprising: a

host system; a set of storage devices, each of which includes physical block addresses that stores data (see explanations above); and a network switch system connecting the host system and the set of storage devices (see explanations above), and configured to define and manage a virtual volume associated with data distributed across the physical block addresses, the network switch system (see explanations above) including: a first virtualization layer that maintains first tier objects including information reflecting a relationship between the physical block addresses and one or more logical partitions of virtual volume data (see explanations above), and a second virtualization layer that maintains second tier objects including information reflecting a logical configuration of the virtual volume (see explanations above), wherein the network switch system manages the virtual volume for the host system using the first and second tier objects (see explanations above).

As to claims 2 and 33, Chandrasekaran teaches wherein the host system sends to the network switch system a request to access the virtual volume and the network switch system leverages the first virtualization layer to collect information associated with the one or more logical partitions associated with the request (see explanations in the rejected claim 1 above).

As to claims 3 and 34, Chandrasekaran teaches wherein the second virtualization layer accesses the first virtualization layer using the second tier mappings

based on a request received from the host system to access information associated with the one or more logical partitions (see explanations in the rejected claim 1 above).

As to claims 4 and 35, Chandrasekaran teaches wherein the first virtualization layer includes first tier storage processors that are each selectively connected to one or more of the storage devices (see explanations in the rejected claim 1 above).

As to claims 5 and 36, Chandrasekaran teaches wherein the first tier mappings include state-based information associated with the logical partitions of the virtual volume (see explanations in the rejected claim 1 above).

As to claims 6 and 37, Chandrasekaran teaches wherein the logical configuration of the virtual volume is at least one of a mirrored virtual volume configuration, a concatenation configuration, a striped virtual volume configuration, and a striped over mirrored virtual volume configuration (see explanations in the rejected claim 1 above).

As to claims 7 and 38, Chandrasekaran teaches wherein the first virtualization layer includes first tier storage processors, each of which includes at least one of (i) a first tier mapping for the virtual volume and (ii) a second tier mapping (see explanations in the rejected claim 1 above).

As to claim 8, Chandrasekaran teaches wherein any first tier storage processor having a second tier mapping and a first tier mappings have communication access to the host system and at least one storage device (see explanations in the rejected claim 1 above).

As to claim 9, Chandrasekaran teaches wherein the second virtualization layer includes second tier storage processors, each of which includes one or more of the second tier mappings and each of which are connected to the host system (see explanations in the rejected claim 1 above).

As to claim 10, Chandrasekaran teaches wherein the network switch system includes a set of storage processors separated into first tier storage processors associated with the first virtualization layer and second tier storage processors associated with the second virtualization layer, and wherein the network switch system includes a switching fabric interconnecting the first tier storage processors and the second tier storage processors (see explanations in the rejected claim 1 above).

As to claim 11, Chandrasekaran teaches a second host system and wherein the each second tier storage processor is connected to at least one of the host system and the second host system, and wherein the set of storage devices are selectively connected to the first tier storage processors (see explanations in the rejected claim 1 above).

As to claim 46, Chandrasekaran teaches wherein managing the virtual volume includes: processing requests from the host system to access or modify the virtual volume and processing requests from the host system to create a new virtual volume (see explanations in the rejected claim 1 above).

Allowable Subject Matter

5. Claims 12-30 and 39-45 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and also overcomes the double patenting rejection.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of records Chandrasekaran does not disclose, teach or suggest the claimed limitations of (in combination with all other features in the claims) claims 12,27 or 39.

Conclusion

6. **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

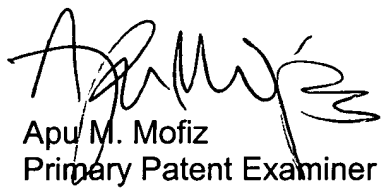
TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Points of Contact

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Apu M. Mofiz whose telephone number is (571) 272-4080. The examiner can normally be reached on Monday – Thursday 8:00 A.M. to 4:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Gaffin can be reached at (571) 272-4146. The fax numbers for the group is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-9600.



Apu M. Mofiz
Primary Patent Examiner
Technology Center 2100

November 28,2006